

CLAIMS

1. A system for development of information systems for health care comprising of a server with a middleware operating system stratified as multiple tiers, each tier composed of software components, wherein software components in one tier interact only with those in the next tier and *the higher tiers* provide *Application Programming Interfaces* (API) for development of application software for health care information systems while the *lower tiers* provide functions of storing, monitoring, communication, securing, management, backup, and recovery of health care information that guarantees *Quality of Service* (QoS) requirements of security, privacy, latency, satisfaction of real-time constraints, and high-availability.
2. The system of Claim 1 where in
 - a. the first tier namely the Foundations tier interfaces with standard platforms J2EE and .NET and provides core operating system functions of resource allocation, process scheduling, memory management including caching, data storage, backup and recovery, and communication services and comprises *work flow engine* and *rules engine* and the
 - b. second tier, namely domain services tier that immediately interfaces, with the said first tier, has software components that guarantee *Quality of Service* (QoS) requirements of security, privacy, latency, satisfaction of real-time constraints, and high-availability utilizing the Foundations tier and provides services including Clinical Data Retrieval, Clinical Data Acquisition, further providing API and domain-specific customizable rules-engines for development of application software for health care information systems.
3. The said Foundations tier of Claim 2 comprising of:
 - Authentication and Authorization
 - Monitoring
 - Messaging
 - Auditing
 - Scheduling
 - Resource allocation
 - Knowledge Integration
 - Image Sound & Video Management
 - Back-up and Disaster Recovery Services
4. The said domain services tier of Claim 2 provides API that is customizable and compliant with the following standards:
 - Drug Interaction Information store with APIs to access and operate on the stored information

- Terminology services for interpretation of health care related terminology
 - Workflow Services
 - Rules engine for specifying portions of behaviors of health care applications
 - Natural Language Processing module for natural language understanding and translation between multiple natural languages
 - Notification module for communication between modules in the DST tier
 - Compliance software module for Digital Imaging and Communications (DICOM) standard,
 - Compliance software module for Health Insurance Portability and Accountability Act (HIPAA) standard,
 - Compliance software module for International Statistical Classification of Diseases and Related Health Problems (ICD),
 - Compliance software module for Health Level Seven (HL7) ANSI standard,
 - Compliance module for SNOMED multi-disciplinary standard vocabulary designed by clinicians,
 - Report management service using CPT codes
 - Module for Clinical Data Documentation System (CDS) for capturing and retrieving medical diagnosis details of a patient
 - Patient Care Management
 - Patient Identity Management (PIM)
 - Imaging Modality Management and Picture Archiving and Communication system
 - Security management
 - Inventory and order management service
5. A method of developing health care applications that guarantee *Quality of Service* (QoS) requirements of security, privacy, latency, satisfaction of real-time constraints, and high-availability comprising of the following steps:
- a. using a library of object-oriented programming classes to create new data objects
 - b. using a library of object-oriented methods to create an application to operate on the data objects created
 - c. automatically verify that the application created is compliant with standards and that it satisfies QoS requirements.
6. A system for communication among various software components comprising of steps based on *publish-subscribe* model as follows:
- a. every software component publishes its availability of data and services while a subscription manager keeps a record of which software components would like to subscribe to which sets of data and services at any time;
 - b. if a software component requires or publishes data or services events are triggered for the data and service exchange to be executed; and

- c. a response destination is associated with a persistent store, so that all outgoing messages could be sent automatically with guaranteed message delivery.
- 7. A method of scheduling tasks committed to by various modules such that every temporal and resource constraints are satisfied thus providing QoS guarantees.
- 8. A method by which the scheduler notifies the task initiator that the constraints cannot be satisfied within the current context with a precise indication of the reasons thereof, providing QoS guarantees.
- 9. A system for providing security for health care information called *Globally Controlled Locally Managed System*, as part of the said domain services tier of claim 2, comprising of *Security Domain* and the *Security Domain Administrator* (SDA) wherein the application will be globally controlled by the system administrator who will be defining privileges to SDA who in turn locally manages the users under SDA's respective Security Domain.
- 10. The said API of claim 1 is designed to make sure that any health care application developed using the API are compatible with health care protocols namely HL7, DICOM, HIPAA, ICD, CPT for seamless integration of multiple disparate health care information systems.
- 11. A software application module as part of the tiers using the API provided by Domain Services Tier of Claim 4 for capturing the clinical, diagnostic, and demographic research information on a patient.
- 12. A software application module as part of the tiers using the API provided by Domain Services Tier of Claim 4 that provides automated mechanisms for admission, discharge, and transfer of patients.
- 13. A software application module as part of the tiers using the API provided by Domain Services Tier of Claim 4 that provides purchase order creation and communication for both materials and drugs.
- 14. A software application module as part of the tiers using the API provided by Domain Services Tier of Claim 4 that provides Electronic Medical Records Management (EMR).
- 15. A software application module as part of the tiers using the API provided by Domain Services Tier of Claim 4 that provides Patient Care Management (PCM).
- 16. A software application module for authentication and authorization using smartcards and biometric devices.

17. A software application module for providing side effects of drugs, interactions among drugs, and interactions among drugs and food interfaces with the database in Foundations tier of claim 3 through the domain services tier of claim 4.
18. A software application module for enabling telemedicine for remote medical diagnosis and treatment with integrated video conferencing.